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Sarcogyne saphyniana sp. nov., a saxicolous lichen from northwestern China

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Abstract — A new species of *Sarcogyne* in the *badiofusca* group is described from northwest China. It differs from *Acarospora badiofusca* in having an algal layer interrupted by wide hyphal bands.

Key words — *Acarosporaceae*, diversity, phylogeny, taxonomy

Introduction

The crustose lichen genus *Sarcogyne* Flot. (*Acarosporaceae*) is characterized by black or red lecideine apothecia with or without a carbonized exciple, a non-carbonized epihymenium, a hymenium with or without branching paraphyses, and asci containing 50–100 or more simple hyaline ascospores (Knudsen & Standley 2007, Fletcher & Hawksworth 2009). The thallus may be endolithic or epilithic. Species occur on non-calcareous or calcareous rock, on soil in biological soil crusts, and one species (*S. lapponica* (Ach.) K. Knudsen & Kocourk.) is known only from a historic collection on wood (Knudsen & Kocourková 2008). The genus contains approximately 40 species, by our estimate. However, it contains many more names than species, because the monographer Magnusson included in *Sarcogyne* many species with a carbonized epihymenium later transferred to *Polysporina* Vězda, but which actually belong in *Acarospora* A. Massal. where they have yet to be transferred (Magnusson 1935 a, & b; Westberg et al. 2015). Recent phylogenetic studies have shown that many current *Acarospora* species should be referred to *Sarcogyne*,

including such well-known species as *Acarospora glaucocarpa* (Ach.) Körb., *A. cervina* (Ach.) A. Massal., and *A. badiofusca* (Nyl.) Th. Fr. (Reeb et al. 2004, Miadlikowska et al. 2014, Westberg et al. 2015). However, the backbone of the most recently published phylogenetic tree is weak, suggesting that *Sarcogyne* is not monophyletic; it is expected that the genus will eventually be divided into several genera (Westberg et al. 2015). For the sake of nomenclatural stability, some current *Acarospora* species (such as *A. badiofusca*) have not yet been transferred to *Sarcogyne*, although they clearly do not belong to *Acarospora* s. str.

In this paper we describe a new *Sarcogyne* species from the mountains of Xinjiang in northwestern China that belongs to the *A. badiofusca* group, a group characterized as having algal layers that may or may not be interrupted by hyphal bundles (Knudsen et al. 2014). The only member of this group that has thus far been sequenced is *A. badiofusca,* which phylogenetic analyses place at the end of a long branch with *A. cervina* (which has an interrupted algal layer) but embedded within *Sarcogyne* (Westberg et al. 2015). Our new species, which has lecideine apothecia and a non-carbonized epihymenium, anatomically also fits the current concept of *Sarcogyne.*

Materials & methods

The examined specimens (including the holotype) are preserved in Arid Land Lichen Research Center of Western China, Xinjiang University, Urumqi, China (XJU-NALH). They were morphologically examined with Olympus STM7 microscope and photographed taken with a Nikon DS-Fi2 and Canon PC1200. Measurements were made in water and amyloid reaction was tested with Lugol's (I). The lichen was checked for secondary metabolites in Solvent C using thin layer chromatography techniques (TLC) (Culberson, 1972).

Taxonomy

Sarcogyne saphyniana A. Abbas, Nurtai & K. Knudsen, **sp. nov.** Figs 1, 2

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Differs from *Acarospora badiofusca* by its algal layer divided by wide hyphal bands into palisades and clumps of algal cells.

Type — China. Xinjiang, Tianshan Grand Canyon, 43°18.89′N 87°19.51′E, alt. 2257 m, sandstone, 10 Jul 2014, A. Abbas, B. Memet, L. Nurtai 20140414 (**Holotype**, XJU-NALH).

Etymology — *Sarcogyne saphyniana* is named in honor of Saphyn, a wise man from Tartar Republic who in 1910 came to Xinjiang, where he helped the poor people and established a school.

Thallus squamulose to areolate, the areoles or squamules round to angular, sometimes imbricate, 0.3–2.1 mm wide, ca 400–800 μm thick. Upper surface

F ig. 1. *Sarcogyne saphyniana* (holotype): Thallus with apothecia. Scale bar = 1 mm.

usually pale brown, sometimes dark brown, smooth, epruinose, sometimes slightly shiny. Lower surface corticated and dark, with a stipe. Upper cortex 35–55 µm thick, its upper layer reddish brown, lower layer hyaline. Algal layer, ≤280 µm thick, interrupted by wide hyphal bands, algal cells 7.5–18 µm in diam. Medulla white, prosoplectenchymatous, ≤385 µm thick, continuous with stipe. Apothecia 1–4 per thallus per unit, round to irregular, 0.3–1.4 mm wide, emerging from the thallus as they mature and projecting above the thallus. Disc reddish-brown, smooth to fissured, margin formed of the exciple, color blackish-brown or same color as disc. Exciple ≤45 µm wide, expanding around the disc ≤100 µm wide. Hymenium hyaline, 66–80 µm high, I+ blue. Epihymenium reddish-brown, ≤18 µm high. Paraphyses 2.0–2.5 µm wide, apices reddish-brown, barely expanded. Asci clavate, 40–7 × 2–17 µm. Ascospores hyaline, simple, broadly ellipsoid, 3.5–5.5 × 2–2.5 µm (N = 50). Subhymenium ≤50 µm high. Hypothecium, hyaline, ≤45 µm high. Pycnidia not observed. Lacking secondary metabolites.

Additional specimens examined — **China. Xinjiang**. Altay Mountains, Two-River Source Nature Reserve, 47°35′N 88°39′E, alt. 1075 m, shale, 18 May 2014, A. Abbas, G. Sahedat 20140412 (XJU-NALH); Altay Mountain Grape Scenic Spot, 47°48′N 88°04′E, alt. 917 m, shale, 16 May 2014, A. Abbas, G. Sahedat 20140418 (XJU-NALH); Tianshan Mountain, Xiao Q Zi Village, 44°08′N 81°42′E, alt. 1490 m, sandstone, 30 Jul 2007, A. Abbas 20077730 (XJU-NALH); Shi Ren Gou, 43°45′N 87°50′E, alt. 1345 m, 24 Jul 2013, sandstone, A. Abbas, G. Nazarbek, L. Nurtai 20137224 (XJU-NALH).

Sarcogyne saphyniana belongs to the *badiofusca* group (Knudsen et al. 2014) characterized by emergent lecideine apothecia with a non-carbonized margin. *Acarospora badiofusca* has a similarly low hymenium but differs in its uninterrupted algal layer. *Sarcogyne saphyniana* has an algal layer interrupted

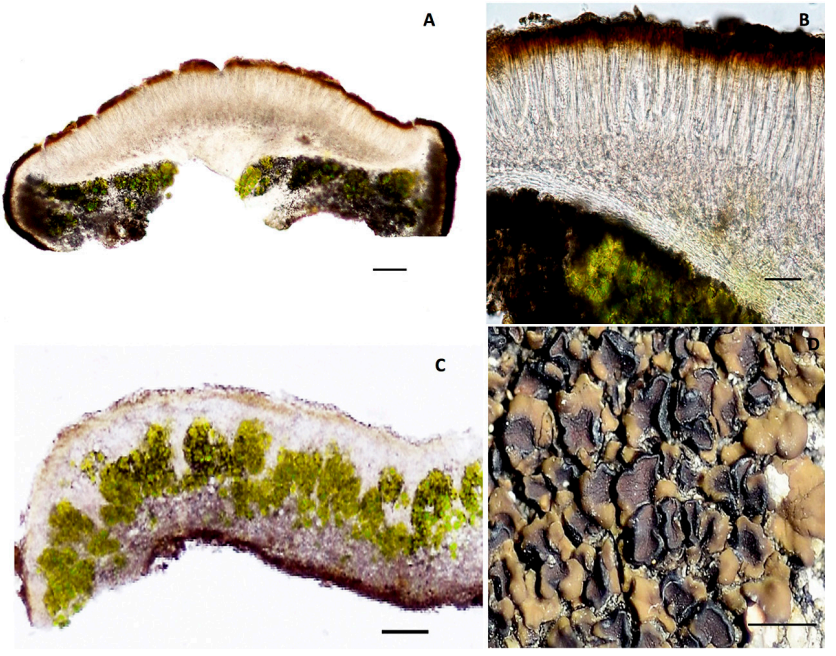

Fig. 2. *Sarcogyne saphyniana* (holotype): A, B. Cross-section of apothecia; C. Interrupted algal layer in thin section of the thallus; D. Thallus with apothecia. Scale bars: A= 50 µm; B = 20 µm; C = 100 µm; D = 1 mm.

by wide hyphal bands as does another member of the *badiofusca* group, the European species *A. irregularis* H. Magn., which differs in its higher (80–140 µm) hymenium (Knudsen et al. 2014). The third member of the *badiofusca* group, *A. boulderensis* H. Magn. from North America, is distinguished by its higher hymenium and an algal layer interrupted by narrow hyphal bands that do not radically break up the algal layer into palisades and clumps of algal cells (Knudsen et al. 2014). *Acarospora cervina* is distinguished from *S. saphyniana* by its higher (85–100 µm) hymenium, narrowly ellipsoid ascospores (4–5 × 2 um), and pruina on the margins or entire thallus (Magnusson 1929; for an example of the typical *A. cervina* phenotype, see Wirth et al. 2013). All species discussed above have an I+ blue hymenium. Of the five *Sarcogyne* species previously reported in China, three have been collected in Xinjiang (Wei 1991, Abbas 1998, 2000).

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Literature cited

Abbas A, Wu JN. 1998. Lichens of Xinjiang, Sci-Tech & Hygiene Publishing House of Xinjiang. Urumqi. 178 p.

Abbas A, Mijit H, Tumur A, Wu JN. 2001. A checklist of the lichens of Xinjiang, China. Harvard Papers in Botany 5(2): 359–370.

Culberson CF. 1972. Improved conditions and new data for the identification of lichen products by a standardized thin-layer chromatographic method. Journal of. Chromatography 72: 113–125.

Fletcher A, Hawksworth D. 2009. *Sarcogyne* A. Massal. (1851). 829–830, in: CW Smith et al. (eds). The Lichens of Great Britain and Ireland. British Lichen Society, Natural History Museum, U.K.

Knudsen K, Kocourková J. 2008. A study of lichenicolous species of *Polysporina* (*Acarosporaceae*). Mycotaxon 105: 149–164.

Knudsen K, Standley SM. 2007. *Sarcogyne.* 289–296, in: TH Nash III et al. (eds). Lichen Flora of the Greater Sonoran Desert Region, Volume 3. Lichens Unlimited, Arizona State University, Tempe.

Knudsen K, Kocourková J, Nordin A. 2014. Conspicuous similarity hides diversity in the *Acarospora badiofusca* group. Bryologist 117(4): 319–328. http://dx.doi.org/10.1639/0007-2745-117.4.319

Magnusson AH. 1929. A monograph of the genus *Acarospora*. Kungliga Svenska Vetenskaps-Akademiens Handlingar, ser. 3, 7. 400 p.

Magnusson AH. 1935a. *Acarosporaceae, Thelocarpaceae.* 1–318, in: AE Zahlbruckner (ed.) Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich, und der Schweiz. 2nd edition. Band 9. Abt. 5. Borntraeger, Leipzig.

Magnusson AH. 1935b ["1934"]. On the species of *Biatorella* and *Sarcogyne* in America. Annales de Cryptogamie Exotique 7: 115–145.

Miadlikowska J, Kauff F, Högnabba F, Oliver, JC, Molnár K, Fraker E, Gaya E, Hafellner J, Hofstetter V, Gueidan C, Otálora MAG, Hodkinson B, Kukwa M, Lücking R, Björk C, Sipman HJM, Burgaz AR, Thell A, Passo A, Mylly L, Goward T, Fernández-Brimem S, Hestmark G, Lendemer JC, Lumbsch HT, Schmull M, Schoch CL, Sérusiaux E, Maddison DR, Arnold AE, Lutzoni F, Stenroos S. 2014. A multigene phylogenetic synthesis for the class *Lecanoromycetes* (*Ascomycota*): 1307 fungi representing 1139 infrageneric taxa, 317 genera and 66 families. Molecular Phylogenetics and Evolution 79: 132–168. http://dx.doi.org/10.1016/j.ympev.2014.04.003

Reeb V, Lutzoni F, Roux C. 2004. Contribution of RPB2 to multilocus phylogenetic studies of the euascomycetes (*Pezizomycotina*, *Fungi*) with special emphasis on the lichen-forming *Acarosporaceae* and evolution of polyspory. Molecular Phylogenetics and Evolution 32: 1036–1060. http://dx.doi.org/10.1016/j.ympev.2004.04.012

Wei JC. 1991 An enumeration of lichens in China. International Academic Publishers.

Westberg M, Millanes AM, Knudsen K, Wedin M. 2015. Phylogeny of the *Acarosporaceae* (*Lecanoromycetes, Ascomycota*, *Fungi*) and the evolution of carbonized ascomata. Fungal Diversity 73:145–158. http://dx.doi.org/10.1007/s13225-015-0325-x

Wirth V, Hauck M, Schultz M. 2013. Die Flechten Deutschlands. 2 Bd. Eugen Ulmer, Stuttgart. 1244 p.